

Section 13

Windstorm Hazard Profile

Definition

The National Weather Services defines a windstorm “as a storm with sustained winds of 40 miles per hour (mph) or gusts of 58 mph or greater, not caused by a thunder storm, expected to last more then 1 hour.”

Description

High winds are a serious hazard in Grays Harbor County from October through March. In the fall and winter, surface winds from the southwest and west associated with storms move onto the coast from the Pacific Ocean. Most storms come on shore with a southwest to northeast airflow with the strongest winds from the south or southwest.

Figure 8

High Wind Producing Storm Track

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Web site: www.wrh.noaa.gov/images/pqr/storm1.gif

Source: *National Weather Service, Portland Oregon Office*

The entire county is vulnerable to winds storms. High winds are commonplace along the coast and in East County, but not as frequently. It is estimated that there is a 170% chance of an occurrence of at least one damaging wind event every year in Grays Harbor County. (State of Washington Hazard Mitigation Plan. Tab 7.1.6 - p.17)

Table 74
Characteristics of Wind Storms in Grays Harbor County

- Prevailing southwesterly and westerly wind
 - Low surface pressure
 - Wind speeds of 40 mph or greater
 - Gale force wind gusts along the coast
 - Heavy surf due to storm surge, higher with a storm tide
 - Coastal erosion
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History

From the early 1850's on wind storms have been important weather events in Gray Harbor County. Early settlers such as Henry Coose recorded accounts of hard wind, southerly gales and rain during the winter on 1852. In 1855, "rough, squally weather on Grays Harbor, very cold, wind blowing a gale form the northwest" is described in the Michael Luark diary. P. W. Gillette writes that the hardest wind storm in 10 years occurred late December 1862. A severe wind storm was noted May 6, 1998 and a gale blew down trees in Hoquiam on Christmas Day 1890.

Wind storms continued to make headlines in the early 1900's. They hampered jetty construction at Grays Harbor in late May 1900 and a storm May 17, 1909 isolated the Grays Harbor area causing heavy damage. A huge storm destroyed the Moclips Beach Hotel, a fashionable resort, and other structures at Moclips beach in February of 1911.

Table 75
Representative Wind Storms in Grays Harbor County
1900 to 1989

Year	Features
October 1913	Wind to 90 mph
November 1915	Wind to 70 mph
January 1921	Wind gusts estimated to 100 mph
December 1923	Wind to 80 mph
February 1927	Wind to 60 mph
January 1934	Wind to 74 mph
February 1937	Wind to 60 mph
November 1940	Winds of 60 to 65 mph
February 1946	Wind to 82 mph
December 1947	Wind to 70 mph
November 1951	Wind to 65 mph
January 1958	Wind to 71 mph
November 1961	Wind to 80 mph
October 1962	Wind gusts to 100 mph or more
October 1963	Wind to 80 mph
December 1965	Wind to 100 mph
December 1970	Wind to 63 mph
January 1971	Wind to 80 mph
January 1975	Wind to 72 mph
January 1986	Wind to 90 mph
January 1988	Wind to 84 mph

Source: Columbia River Chronology, Historical Dates, Pacific County Historical Society and Museum and National Climate Data Center.

Several windstorms of impressive magnitude to hit Grays Harbor County's have made national headlines.

The Great Blow Down

In January of 1921 there was a severe wind storm which became know as the "great blow down". Wind velocity on Grays Harbor was estimated at 100 mph. Ships and river craft broke loose of moorings, in some cases smashing into bridges, and whole sections of timber were blown down all along the west side of the Olympic peninsula.

The Columbus Day Storm

On October 12, 1962 the strongest non tropical wind storm recorded in the lower 48 states in American history struck Grays Harbor County. Peak wind gusts of 100 mph were recorded. This storm was compared to the devastating storm of 1921 and was selected the top weather event to occur in Washington State from 1900 to 1999.

There was extensive damage with power and telephone outages throughout the entire county. Trees were blown down in the North Beach area and the Markham Branch of the Northern Pacific Railroad was blocked. Many trees were blown down in Copalis beach and along the highway and the road was blocked from Montesano west to Grass Creek. An estimated 35,000,000 board feet of timber was lost according to Wilton Vincent, Rayoneir Land Department Manager. The Grays Harbor PUD facilities damage was \$50,000 with total damages in the county reported to be approximately 2.5 million dollars.

The Inauguration Day Storm

January 20, 1993 a fierce wind storm hit the entire Puget Sound Area. Five people were killed, state government was shut down, and at the height of the storm more than 750,000 residential and commercial customers were without power. Due to damages from the storm in the county, Grays Harbor was included in federal disaster declaration, #981 specified for this storm. Wind gusts of 70 mph were reported at Twin Harbors. The frame work for a new Washington State Department of Fisheries storage building at the Highway 12 and Devonshire Interchange collapsed and a roof was torn off a mobile home in Satsop. There were widespread power outages; however, officials estimated that not more than 4,000 people without power at anytime. East County was hardest hit with outages in Elma, Montesano, Central Park and the Wynochee River Valley. There were also power outages at Humptulips and Copalis Beach.

Information gathering has become more sophisticated and comprehensive over the years providing more detailed data. This is especially true of information about wind speed data reported from 1990's through 2004. National Weather Service stations, satellite information and the weather spotter program all provide this information for Grays Harbor County.

Table 76
Significant Wind Storms in Grays Harbor County
1990 – 2004

January 1993	Wind gusts to 70 mph
March 1994	High winds with gusts of 75 mph recorded at Ocean Shores and 63 mph at Hoquiam.
October 1994	Winds to 73 mph with sustained winds of 55 mph
December 1995	A windstorm at South Beach with sustained winds clocked as high as 80 mph with gusts up to 100
January 1, 1997	Wind to 79 mph
March 17, 1997	Winds to 58 mph with peak gusts of 71 mph at Westport and Hoquiam
March 30, 1997	Winds to 82 mph at Oceans Shores and 62 mph at Hoquiam
January 16, 1998	Sustained winds of 45 mph on coast with gust to 54 mph
November 23, 1998	Sustained wind of 50 mph with gusts to 76 mph
January 28, 1999	Sustained winds of 40 mph
February 2, 1999	Sustained winds 30 to 50 mph with gusts to 68 mph
March 2, 1999	Gusts to 70 mph
January 16, 2000	Sustained winds of 40 to 45 mph with gusts to 68
February 14, 2000	Winds gusting to 65 mph
November 19, 2001	Winds to 60 mph along the coast
December 1, 2001	Winds to 58 mph
December 13, 2001	Gusts to 69 mph
December 15, 2001	Sustained winds of 40 mph with gusts to 60 mph
April 13, 2002	Winds to 63 mph

December 14, 2002	High winds to 58 mph or more.
December 15, 2002	Winds to 71 mph
December 27, 2002	Winds to 60 mph
January 1 & 2, 2003	Winds to 67 mph
March 12, 2003	Winds to 75 mph with the strongest wind along the coast
March 2004	Winds to 46 mph

Source: National Climate Data Center.

Effect

Most storms with winds of more than 40 mph can be expected to cause some damage. Damage effects based on visual clues correlated with the Beaufort wind force scale provide a useful picture of possible wind damage that could occur in Grays Harbor County.

Table 77
Wind Damage Effects Based on Wind Speed in mph and Visual Observation

Wind Speed	Damage Potential
39 to 46	Broken twigs and small branches.
47 to 54	Structural damage occur, such as chimney covers, roofing tile blown off, and television antennas damaged. Ground littered with many small twigs and broken branches.
55 to 63	Considerable structural damage occur, especially on roofs. Small trees may be blown over and uprooted.
64 to 75	Widespread damage occurs. Large trees blown over and uprooted.
Over 75	Considered hurricane force and can cause widespread damage.

Source: National Weather Service

The following selected examples illustrate typical consequences of wind storms in the county. To date, power outages are the number one impact associated with wind storms in the county. Other problems from past wind storms have been: property damage, transportation disruptions, beach erosion and, on occasion, school closures. Outages have caused large numbers of people in the county to be without electric power over the years. For example, 50% of Grays Harbor PUD customers were without power in 1979. Power outages, a common occurrence during most wind storms, are usually a result of tree branches, limbs and downed trees falling or blowing on power lines. Sub stations can be knocked out disrupting power as was the case during the November 1998 wind storm when two major stations were disabled cutting power to a large number of customers in the North Beach and Humptulips areas.

In March of 1997, 2,500 South Beach residents were without power and 15,000 customers lost electricity as a result of high winds in November of 1998. In 2002 toppled trees knocked out power to about 3,500 customers on December 14th and 1,000 customers December 15th. Nearly one third of the Grays Harbor PUD customer base was without power during parts of the night on November 23rd and 20,000 customers lost power when outages peaked at around midnight on November 24th 2002. Examples of other power outages documented since 1994 include those from storms in 1994, 1997, 1999, 2000, 2001, 2002 and 2003.

Downed trees and blowing debris on roads have caused traffic problems. Debris alone scattered across roads may be enough to present dangerous driving conditions. High winds in 1996 knocked a tree into a State Department of Transportation truck. During the November 1998 wind storm numerous roadways were blocked with reports of downed trees in Satsop, Elma, Central Park, North River, Amanda Park and Montesano.

Property damage from the February 1979 storm caused estimated damages of \$100,000 to \$150,000 dollars to private property. In 1999 part of the Ocosta School roof flew off and property damage in from winds on December 14 and 15, 2002 was reported as \$45,000. Emergency water supplies had to be brought to Pacific Beach in December 2002.

One of the most damaging features of winds storms along the coast is beach erosion caused by storm surges, large waves that hit the beaches as a storm makes landfall. Damage from high surf eroded 40' of beach near Westhaven State Park in 2001. If a storm surge hits at the same time as high tide, water heights will be even greater. Heavy swells from 15 to 17 feet were reported at South Beach in November 1998 and waves of 20 to 24 feet hit the coast during the December 2002 storm. The sand spit between Half Moon Bay and the parking lot at Westhaven State Park decreased 1 inch in width as a result of storms in the winter season of 2002 and 2003.

Wind producing waves are also a read danger and people put themselves at risk if they go on the beaches during high winds. Logs in the water can easily crush a person and the surf can drag an individual out to sea. To date there have been no fatalities in the county; however, storm watching as a tourist activity is becoming more popular and poses a serious hazard along beaches.

Asset Vulnerability Analysis for Structures and People

High winds can affect the entire county; thus all property and residents would be at risk. The analysis on Table(s) 5-12 represents an estimated percentage, high 5% and low 1%, of the total structures and residents in the County which may be exposed to damage by a severe winter storm.

Although summer is the height of tourist season at coastal beaches, it can also be expected there will be tourists visiting the area year round. Storm watching in the winter month has become a popular tourist activity. These people, of course, will be vulnerable to a wind storm, but it is not feasible to estimate a number given the variation in visitors by day and year.

**Table 78
Windstorm
High Estimate
District 1**

Land Use	Number of Structures			Value of Structures in Dollars			Number of People		
	Total Number	Number Exposed to Hazard	Percent Exposed to Hazard	Total Value	Total Value Exposed to Hazard	Percent Exposed	Total People	Number Exposed to Hazard	Percent Exposed to Hazard
Residential	4,384	219	5.0%	358,814,110	17,940,706	5.0%	10,872	544	5.0%
Manufacturing	21	1	5.0%	49,266,847	2,463,342	5.0%			
Transportation, Communication & utilities									
	22	1	5.0%	102,451,430	5,122,572	5.0%			
Trade	38	2	5.0%	6,286,350	314,318	5.0%			
Services	62	3	5.0%	24,537,375	1,226,869	5.0%			
Cultural, Entertainment & Recreation									
	31	2	5.0%	10,697,220	534,861	5.0%			
Agriculture	277	14	5.0%	30,038,035	1,501,902	5.0%			
Fisheries & Forestry									
	126	6	5.0%	11,894,785	594,739	5.0%			
Structures on Undeveloped Lands									
	114	6	5.0%	33,638,240	1,681,912	5.0%			
TOTALS	5,075	254	5.0%	627,624,392	31,381,220	5.0%	10,872	544	5.0%

**Table 79
Windstorm
High Estimate
District 2**

Land Use	Number of Structures			Value of Structures in Dollars			Number of People		
	Total Number	Number Exposed to Hazard	Percent Exposed to Hazard	Total Value	Total Value Exposed to Hazard	Percent Value Exposed	Total People	Number Exposed to Hazard	Percent Exposed to Hazard
Residential	1,914	96	5.0%	138,115,404	6,905,770	5.0%	4,747	206	4.3%
Manufacturing	6	0	5.0%	75,389,901	3,769,495	5.0%			
Transportation, Communication & utilities	12	1	5.0%	4,374,935	218,747	5.0%			
Trade	34	2	5.0%	3,574,140	178,707	5.0%			
Services	45	2	5.0%	186,598,830	9,329,942	5.0%			
Cultural, Entertainment & Recreation	33	2	5.0%	8,833,645	441,682	5.0%			
Agriculture	27	1	5.0%	2,342,965	117,148	5.0%			
Fisheries & Forestry	46	2	5.0%	4,392,195	219,619	5.0%			
Structures on Undeveloped Lands	99	5	5.0%	3,827,925	191,396	5.0%			
TOTALS	2,216	111	5.0%	427,449,940	21,372,497	5.0%	4,747	206	4.3%

**Table 80
Windstorm
High Estimate
District 3**

Land Use	Number of Structures			Value of Structures in Dollars			Number of People		
	Total Number	Number Exposed to Hazard	Percent Exposed to Hazard	Total Value	Total Value Exposed to Hazard	Percent Value Exposed	Total People	Number Exposed to Hazard	Percent Exposed to Hazard
Residential	2,823	141	5.0%	172,086,580	8,604,329	5.0%	7,001	303	4.3%
Manufacturing	48	2	5.0%	9,766,936	488,347	5.0%			
Transportation, Communication & utilities	24	1	5.0%	18,374,255	918,713	5.0%			
Trade	65	3	5.0%	6,052,930	302,646	5.0%			
Services	153	8	5.0%	40,108,232	2,005,412	5.0%			
Cultural, Entertainment & Recreation	72	4	5.0%	18,680,430	934,022	5.0%			
Agriculture	24	1	5.0%	1,376,160	68,808	5.0%			
Fisheries & Forestry	80	4	5.0%	6,229,575	311,479	5.0%			
Structures on Undeveloped Lands	128	6	5.0%	4,231,935	211,597	5.0%			
TOTALS	3,417	171	5.0%	276,907,033	13,845,352	5.0%	7,001	303	4.3%

**Table 81
Windstorm
High Estimate
All Districts**

Land Use	Number of Structures			Value of Structures in Dollars			Number of People		
	Total Number	Number Exposed to Hazard	Percent Exposed to Hazard	Total Value	Total Value Exposed to Hazard	Percent Exposed	Total People	Number Exposed to Hazard	Percent Exposed to Hazard
Residential	9,121	456	5.0%	669,016,094	33,450,805	5.0%	22,620	981	4.3%
Manufacturing	75	4	5.0%	134,423,684	6,721,184	5.0%			
Transportation, Communication & utilities	58	3	5.0%	125,200,620	6,260,031	5.0%			
Trade	137	7	5.0%	15,913,420	795,671	5.0%			
Services	260	13	5.0%	251,244,437	12,562,222	5.0%			
Cultural, Entertainment & Recreation	136	7	5.0%	38,211,295	1,910,565	5.0%			
Agriculture	328	16	5.0%	33,757,160	1,687,858	5.0%			
Fisheries & Forestry	252	13	5.0%	22,516,555	1,125,828	5.0%			
Structures on Undeveloped Lands	341	17	5.0%	41,698,100	2,084,905	5.0%			
TOTALS	10,708	535	5.0%	1,331,981,365	66,599,068	5.0%	22,620	981	4.3%

**Table 82
Windstorm
Low Estimate
District 1**

Land Use	Number of Structures			Value of Structures in Dollars			Number of People		
	Total Number	Number Exposed to Hazard	Percent Exposed to Hazard	Total Value	Total Value Exposed to Hazard	Percent Exposed	Total People	Number Exposed to Hazard	Percent Exposed to Hazard
Residential	4,384	44	1.0%	358,814,110	3,588,141	1.0%	10,872	109	1.0%
Manufacturing	21	0	1.0%	49,266,847	492,668	1.0%			
Transportation, Communication & utilities	22	0	1.0%	102,451,430	1,024,514	1.0%			
Trade	38	0	1.0%	6,286,350	62,864	1.0%			
Services	62	1	1.0%	24,537,375	245,374	1.0%			
Cultural, Entertainment & Recreation	31	0	1.0%	10,697,220	106,972	1.0%			
Agriculture	277	3	1.0%	30,038,035	300,380	1.0%			
Fisheries & Forestry	126	1	1.0%	11,894,785	118,948	1.0%			
Structures on Undeveloped Lands	114	1	1.0%	33,638,240	336,382	1.0%			
TOTALS	5,075	51	1.0%	627,624,392	6,276,244	1.0%	10,872	109	1.0%

**Table 83
Windstorm
Low Estimate
District 2**

Land Use	Number of Structures			Value of Structures in Dollars			Number of People		
	Total Number	Number Exposed to Hazard	Percent Exposed to Hazard	Total Value	Total Value Exposed to Hazard	Percent Exposed	Total People	Number Exposed to Hazard	Percent Exposed to Hazard
Residential	1,914	19	1.0%	138,115,404	1,381,154	1.0%	4,747	41	0.9%
Manufacturing	6	0	1.0%	75,389,901	753,899	1.0%			
Transportation, Communication & utilities	12	0	1.0%	4,374,935	43,749	1.0%			
Trade	34	0	1.0%	3,574,140	35,741	1.0%			
Services	45	0	1.0%	186,598,830	1,865,988	1.0%			
Cultural, Entertainment & Recreation	33	0	1.0%	8,833,645	88,336	1.0%			
Agriculture	27	0	1.0%	2,342,965	23,430	1.0%			
Fisheries & Forestry	46	0	1.0%	4,392,195	43,922	1.0%			
Structures on Undeveloped Lands	99	1	1.0%	3,827,925	38,279	1.0%			
TOTALS	2,216	22	1.0%	427,449,940	4,274,499	1.0%	4,747	41	0.9%

**Table 84
Windstorm
Low Estimate
District 3**

Land Use	Number of Structures			Value of Structures in Dollars			Number of People		
	Total Number	Number Exposed to Hazard	Percent Exposed to Hazard	Total Value	Total Value Exposed to Hazard	Percent Exposed	Total People	Number Exposed to Hazard	Percent Exposed to Hazard
Residential	2,823	28	1.0%	172,086,580	1,720,866	1.0%	7,001	61	0.9%
Manufacturing	48	0	1.0%	9,766,936	488,347	5.0%			
Transportation, Communication & utilities	24	0	1.0%	18,374,255	918,713	5.0%			
Trade	65	1	1.0%	6,052,930	302,646	5.0%			
Services	153	2	1.0%	40,108,232	2,005,412	5.0%			
Cultural, Entertainment & Recreation	72	1	1.0%	18,680,430	934,022	5.0%			
Agriculture	24	0	1.0%	1,376,160	68,808	5.0%			
Fisheries & Forestry	80	1	1.0%	6,229,575	311,479	5.0%			
Structures on Undeveloped Lands	128	1	1.0%	4,231,935	211,597	5.0%			
TOTALS	3,417	34	1.0%	276,907,033	13,845,352	5.0%	7,001	61	0.9%

**Table 85
Windstorm
Low Estimate
All Districts**

Land Use	Number of Structures			Value of Structures in Dollars			Number of People		
	Total Number	Number Exposed to Hazard	Percent Exposed to Hazard	Total Value	Total Value Exposed to Hazard	Percent Exposed	Total People	Number Exposed to Hazard	Percent Exposed to Hazard
Residential	9,121	91	1.0%	669,016,094	6,690,161	1.0%	22,620	196	0.9%
Manufacturing	75	1	1.0%	134,423,684	1,734,914	1.3%			
Transportation, Communication & utilities	58	1	1.0%	125,200,620	1,986,976	1.6%			
Trade	137	1	1.0%	15,913,420	401,251	2.5%			
Services	260	3	1.0%	251,244,437	4,116,774	1.6%			
Cultural, Entertainment & Recreation	136	1	1.0%	38,211,295	1,129,330	3.0%			
Agriculture	328	3	1.0%	33,757,160	392,616	1.2%			
Fisheries & Forestry	252	3	1.0%	22,516,555	474,349	2.1%			
Structures on Undeveloped Lands	341	3	1.0%	41,698,100	586,258	1.4%			
TOTALS	10,708	107	1.0%	1,331,981,365	17,512,632	1.3%	22,620	196	0.9%

Asset Vulnerability Analysis for Structures and People

County Facilities At-Risk to Wind Storm Hazard

All county facilities are potentially at-risk to wind storm hazards.

Critical Facilities Serving County Government & Residents At-Risk to Wind Hazards

All critical facilities are potentially at-risk to wind storm hazards.